AMENDMENTS TO THE SPECIFICATION

Please amend the specification as follows:

Page 1, prior to the first paragraph, please insert:

BACKGROUND OF THE INVENTION

Page 1, the second full paragraph is amended as follows:

The invention relates more particularly to methods and apparatuses enabling such relief to be made by anisotropic chemical ~~attack~~ etching by plasma, for making silicon-based components, e.g. semiconductor components for electronics, or parts for micromechanical components.

Page 2, the second full paragraph is amended as follows:

The micromachining of silicon substrates is presently performed by plasma etching techniques. The technique that is the most widespread for this purpose at present is fluorinated gas plasma etching as described in documents US 5 501 893 and US 4 985 114. That technique consists in protecting part of the silicon substrate by a mask, and in subjecting the substrate as protected in part in this way to an alternating succession of ~~attack~~ etching steps using a plasma of etching gas, and of passivation steps using a plasma of passivation gas. During each ~~attack~~ etching step, the plasma of etching gas such as sulfur hexafluoride SF6 makes cavities in those zones of the substrate that are not protected by the mask. During each passivation step, the plasma of passivation gas such as a fluorocarbon gas, e.g. C4F8, deposits a protective polymer film on the wall of the cavity. Each of these ~~attack~~ etching and passivation steps is of very short duration, e.g. a few seconds, and the passivation serves, during the subsequent ~~attack~~ etching

step, to ensure that the plasma of etching gas does not ~~attack~~ etch the side wall of the cavity. As a result, ~~attack~~ etching takes place selectively in the bottom of the cavity, after the plasma of etching gas has removed the protective polymer film from the bottom of the cavity. Thus, in spite of the isotropic nature of the way in which silicon is ~~attacked~~ etched by a plasma of etching gas such as a fluorinated gas, the resulting etching of the silicon is quasi-anisotropic, fast, and selective.

Page 3, the second full paragraph is amended as follows:

To do this, a first solution has been to increase the energy of the ions during the etching step, by increasing the bias voltage of the substrate. This reduces the number of ions lost against the walls of the trench, and it is possible to benefit from a larger number of ions for breaking up the layer of polymer in the bottom of the trench. It has thus been possible to increase the aspect ratio a little, but only from a ratio of 20 to a ratio of 23. However, that solution presents the major drawback of increasing the rate at which the mask itself is ~~attacked~~etched, which mask is made of silica or of photosensitive resin, thereby reducing the selectivity of the etching.

Page 4, the second full paragraph is amended as follows:

The results of those tests are summarized in Figure 2. Curve A represents the usual method of etching by alternating steps of ~~attack~~ etching by means of a plasma of fluorinated gas and steps of passivation by a plasma of fluorocarbon gas, in accordance with document US 5 501 893. Curve B shows the result obtained by increasing the bias voltage of the substrate, i.e. by increasing the bombardment energy of the plasma ions. Curve C shows the result obtained by

moving the substrate closer to the plasma source. Curve D shows the result obtained by reducing the pressure of the atmosphere in the etching chamber by a factor of 2.

Page 5, before the first full paragraph, please insert:

SUMMARY OF THE INVENTION

Page 5, the first full paragraph is amended as follows:

An object of the present invention is to implement etching of silicon with anisotropy that is almost perfect, without undercut ~~attack~~ etching and without the cavity tapering progressively, down to depths that are considerably increased, making it possible to achieve aspect ratios greater than 30.

Page 5, the second full paragraph is amended as follows:

Preferably, the invention also seeks to implement such etching at speeds that are at least as fast if not faster than the etching speeds achieved by known methods of alternating steps of ~~attack~~ etching by fluorinated gas plasma and passivation by fluorocarbon gas plasma.

Page 5, the third full paragraph is amended as follows:

To achieve these objects and others, the invention provides a method of etching silicon anisotropically, in which a silicon substrate protected in part by a mask is subjected to an alternating succession of ~~attack~~ etching steps using a plasma of etching gas to make cavities in zones of the substrate that are not protected by the mask, and passivation steps using a plasma of

passivation gas for depositing protective polymer on the walls of the cavities that result from the ~~attack~~ etching steps~~,~~.

Page 5, the fourth full paragraph is amended as follows:

~~the~~ The method of the invention further comprises selective depassivation pulse steps in which the protective polymer deposit is subjected to the action of a plasma of cleaning gas that removes the protective polymer from the bottom zones of the cavities and that is more effective than the etching gas.

Page 6, the second full paragraph is amended as follows:

Advantageously, each selective depassivation pulse step does not overlap the preceding passivation step, and does not overlap the following ~~attack~~ etching step.

Page 7, between the first and second full paragraphs, please insert:

BRIEF DESCRIPTION OF THE DRAWINGS

Page 7, the fifth full paragraph is amended as follows:

Figure 3 is a graph plotting the speed with which a protective polymer film is ~~attacked~~etched, as a function of the substrate bias voltage, firstly for ~~attack~~ etching using SF6, and secondly for ~~attack~~ etching using an oxygen plasma;

Page 7, between the ninth and tenth paragraphs, please insert:

DETAILED DESCRIPTION OF THE INVENTION

Page 9, the first full paragraph is amended as follows:

It can be seen that the first step a) of ~~attack~~ etching consists in opening the valve 16 to generate a plasma 9 of etching gas. The first step a) of ~~attack~~ etching is followed by a non-overlapping, second step b) of passivation during which the valve 16 is closed and the valve 17 is open in order to generate a plasma 9 of passivation gas. Thereafter, the valve 17 is closed, and during a selective depassivation step c), the valve 18 is opened to generate a plasma 9 of cleaning gas. Thereafter the valve 18 is closed and the operations are restarted in a step d) by opening the valve 16 again to generate a plasma of etching gas, and so on.

Page 9, the third full paragraph is amended as follows:

During step a) of generating a plasma of etching gas, there is admitted into the enclosure 1 an etching gas of the fluorinated gas type, such as SF6, CF4, or NF3, for example. Excellent results are obtained using sulfur hexafluoride SF6. During this step, the atoms of fluorine generated by the plasma ~~attack~~ etch the exposed surface area of silicon in isotropic manner. Figure 6 is a diagram showing the action of the plasmas on the substrate: the substrate 2 is shown in fragmentary section at a large scale, at the location where a cavity 2b is to be made: the substrate 2 is covered by a mask 2c which includes an opening 2d in register with the cavity 2b that is to be made. Thus, under the opening 2d, the surface of the substrate 2 remains visible and accessible to the plasma.

Page 10, the first full paragraph is amended as follows:

In view a) of Figure 6, there is shown the action of the plasma of etching gas SF6 ~~attacking~~ etching the silicon of the substrate 2 isotropically in register with the opening 2d so as to make a first segment 2b1 of the cavity 2b. The duration of the etching step between instants t1 and t2 in Figure 5 is selected so that the first segment 2b1 of the cavity presents a shape that differs little from the desired shape, i.e. with a side wall 2e that is substantially perpendicular to the surface 2a of the substrate. A first segment 2b1 having a depth of a few micrometers can be appropriate. It is possible to select etching parameters of the kind commonly used, for example : the substrate 2 may be biased at about 20 volts (V) to 80 V, the pressure of the gaseous atmosphere 5 inside the enclosure 1 may be about 10 pascals (Pa) to 100 Pa, and the flow rate of the etching gas may be about 10 standard cubic centimeters per minute (sccm) to 200 sccm.

Page 11, the first full paragraph is amended as follows:

The substrate 2 is preferably simultaneously biased by the bias source 4 so as to ~~attack~~ attract the ions of oxygen to the substrate 2.

The paragraph beginning on page 11 and ending on page 12 is amended as follows:

During the pulse step of selective depassivation or cleaning, the substrate 2 is biased with a voltage close to that used during the ~~attack~~ etching step, typically in the range 20 V to 120 V, and advantageously in the range 20 V to 80 V, so as to attract the plasma ions. The pressure of the atmosphere 5 surrounding the substrate 2 lies in the range 0.5 Pa to 10 Pa, and preferably lies in the range 2 Pa to 5 Pa. The flow rate of the cleaning gas lies in the range 10 sccm to 100

sccm, and the duration of step c) is selected to be just sufficient to ensure effective cleaning of the bottom zones 2g of the cavities 2b.

Page 12, the second full paragraph is amended as follows:

Thereafter, during step d), an ~~attack~~ etching step is performed again similar to step a), by the action of the plasma of the etching gas SF6, thereby making a second segment 2b2 of the cavity 2b. Thereafter, there follows a pulse step of passivation, and a step of depassivation, and so on.

The paragraph beginning on page 12 and ending on page 13 is amended as follows:

Furthermore, the duration of the selective depassivation pulse step may be selected to increase from one depassivation step to another during the process of etching a single substrate 2. As shown in Figure 1, the initial etching steps enable a cavity to be made having a side wall that is substantially vertical up to an aspect ratio of about 20 without there being any need to use lengthy cleaning steps in order to conserve a constant section for the cavity. The advantage of the depassivation step is then merely that of increasing the speed of the method. However, thereafter, it becomes essential to use the depassivation step in order to guarantee that an aspect ratio in excess of 20 or 30 can be achieved. It is therefore possible to consider using depassivation steps of duration that is progressively longer with increasing aspect ratio, or indeed depassivation steps in increasing numbers, for example rising from one passivation step for three ~~attack~~ etching and passivation steps, to one depassivation step for two ~~attack~~ etching and

passivation steps, and passing finally to one depassivation step for one ~~attack~~ etching and passivation step.